Intelligent Mixed-Signal Microsystems Technology (IMMST)

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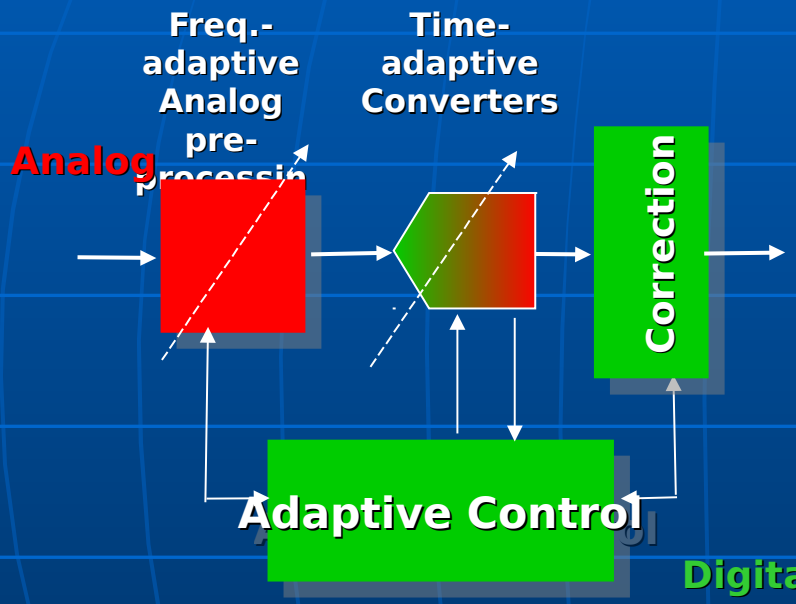
Intelligent Mixed-Signal Microsystems Techn

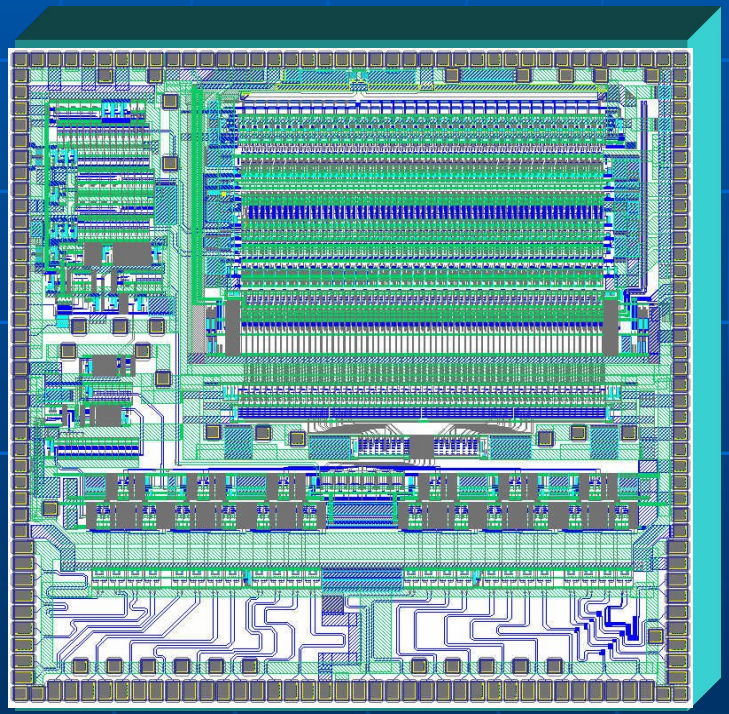


Objectives:

Demonstrate a new class of mixed-signal integrated microsystems in which self-assessment and embedded optimization is exploited to achieve adaptable circuit

Benefits:
Real time - BW/Dynamic Range optimization to enable adaptive and “intelligent” data-fused sensors and cognitive information exploitation

Today’s Mixed-Signal Technology Limitatio

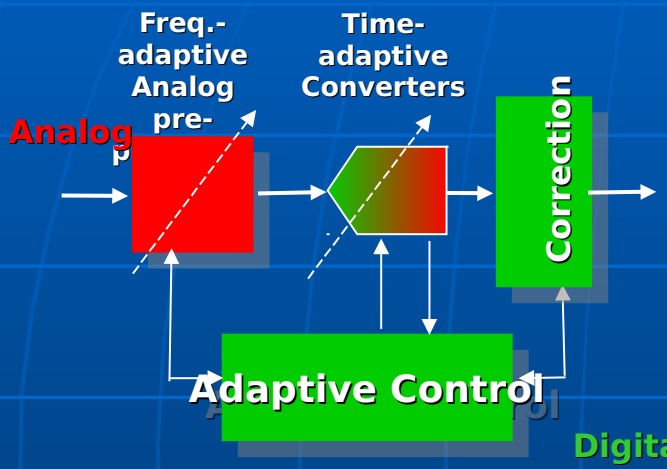


- Circuit design is operation-specific – not suitable to sustain real-time dynamic range/bandwidth trade-offs
- Integrated Circuit architectures are hard-wired and driven by layout optimization (designers choice)
- Manufacturing and design uncertainty can limit component performance
- Performance can drift with environmental changes and aging

What is the type of Problem we are trying to solve?

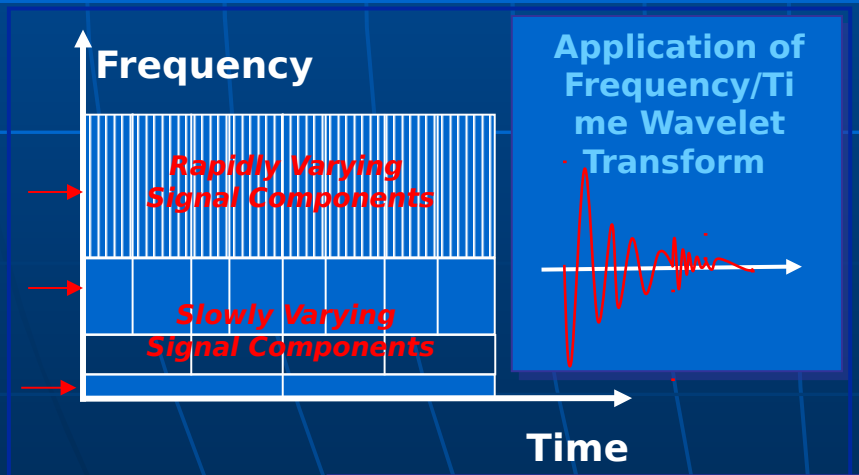
- Digitization of weak signals in the presence of a strong interference
- Active tracking of chirp signals over a large spectral bandwidth
- Digitization of a narrow band, pseudo-random hopping signals over a large spectral bandwidth

Example of a Intelligent Digitization of Analog Signals



Goals:

Extend the dynamic range-bandwidth performance of multifunctional signal processing systems by exploring revolutionary concepts in analog-to-digital and digital-to-analog conversion techniques that will allow systems optimize themselves in real-time to the signals of interest achieving orders of magnitude improvements and efficiency in the digitization process.

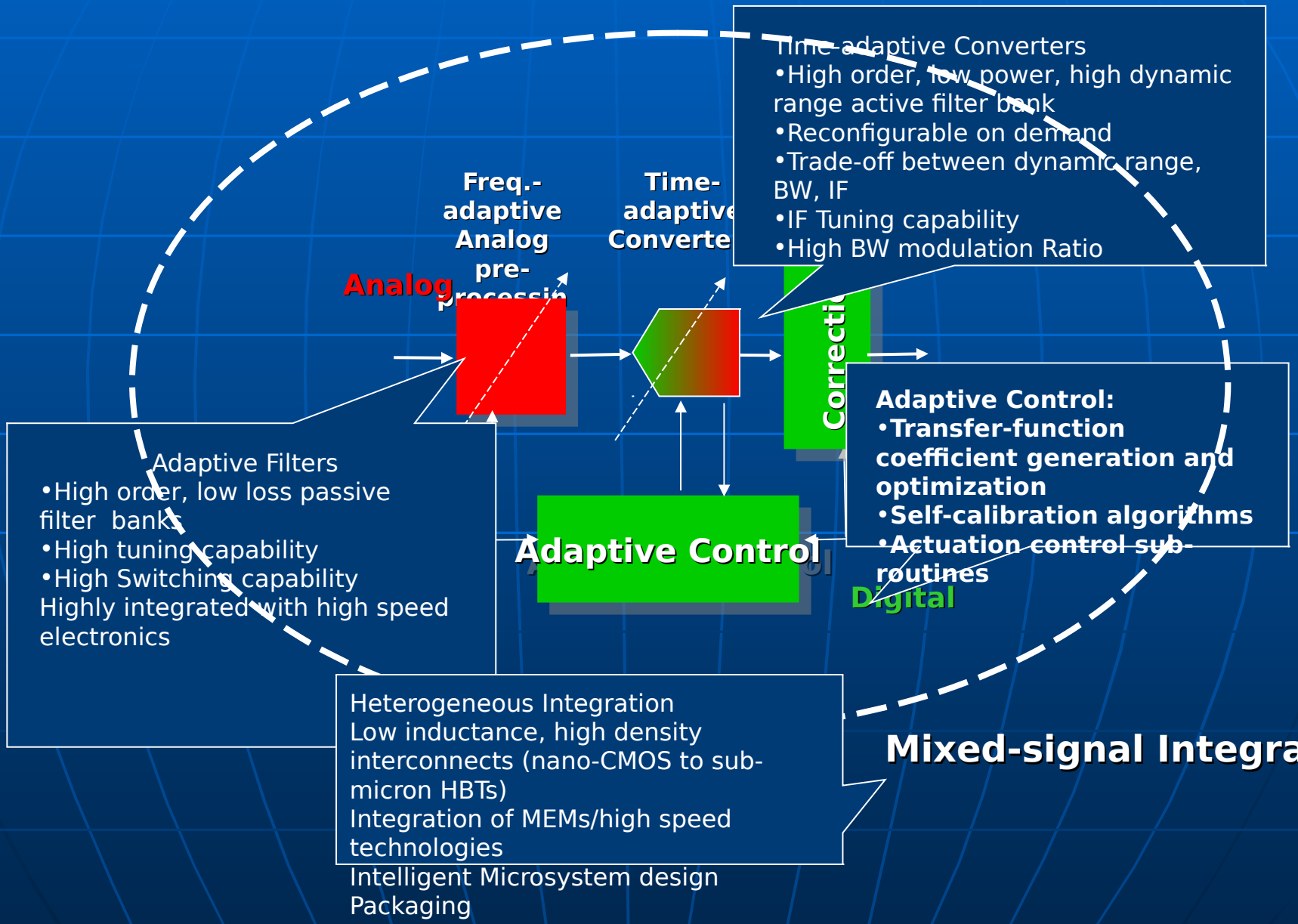


Challenges:

- **Adaptive analog pre-processing architectures/algorithms**
- **Embedded linearization techniques for mixed-signal components**
- **Reconfiguration techniques for mixed-signal components**
- **Mixed-signal integration strategies**

Enable a new class of adaptable, multifunctional RF sensors and communication systems

IMMST Technical Challenges

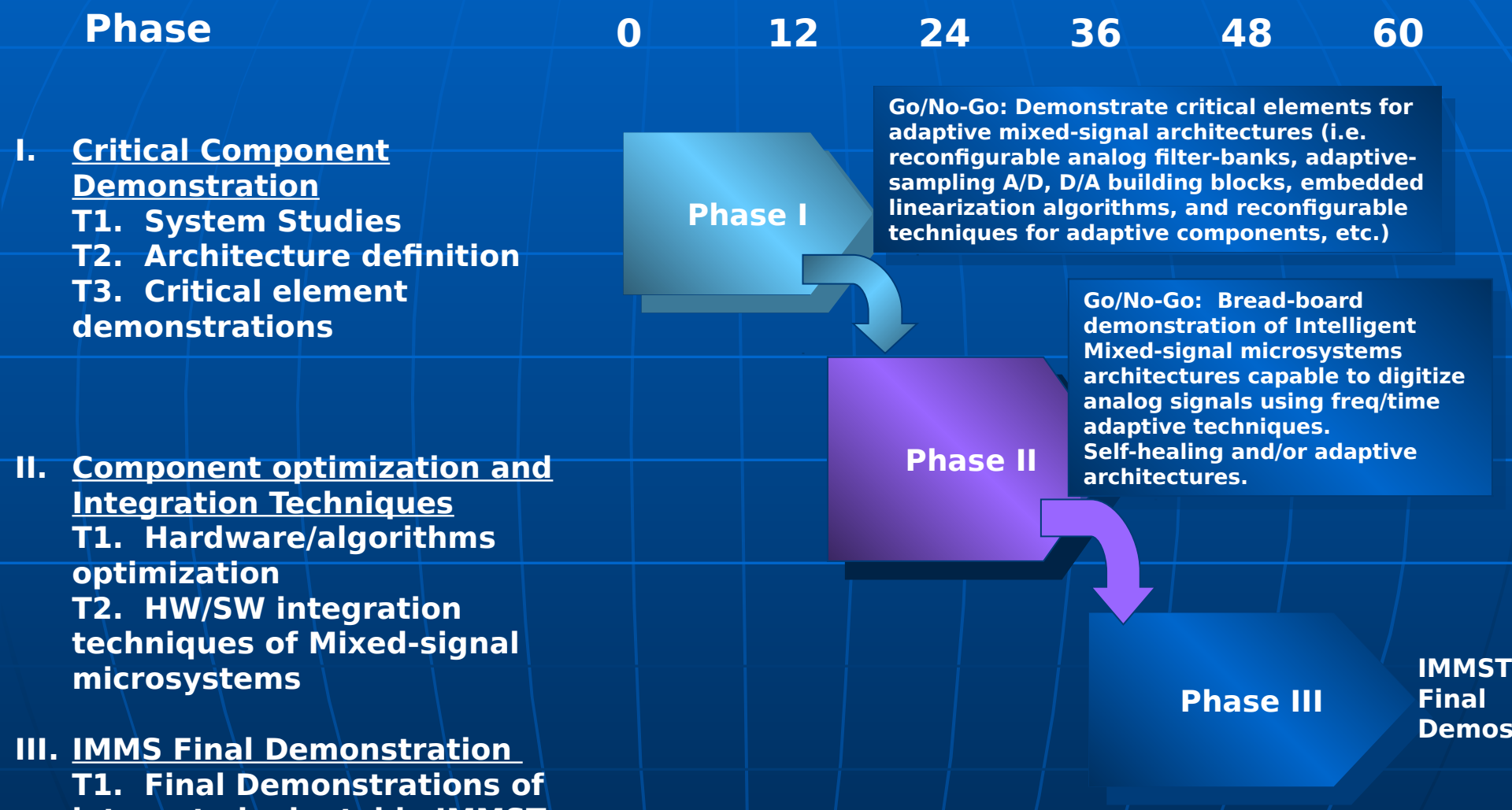


Example of Potential Metrics for IMMST Digitizers

Objectives: To be filed by proposer

	Today	Go/No-Go 18 MAC	Final Goal
Frequency-Adaptive Filter Bank			
Time-Adaptive ADC Bank			
Architecture			

IMMST Program Plan


Phase
0
12
24
36
48
60
I. Critical Component Demonstration
T1. System Studies
T2. Architecture definition
T3. Critical element demonstrations
Phase I
Go/No-Go: Demonstrate critical elements for adaptive mixed-signal architectures (i.e. reconfigurable analog filter-banks, adaptive-sampling A/D, D/A building blocks, embedded linearization algorithms, and reconfigurable techniques for adaptive components, etc.)
Phase II
Go/No-Go: Bread-board demonstration of Intelligent Mixed-signal microsystems architectures capable to digitize analog signals using freq/time adaptive techniques. Self-healing and/or adaptive architectures.
II. Component optimization and Integration Techniques
T1. Hardware/algorithms optimization
T2. HW/SW integration techniques of Mixed-signal microsystems
Phase III
IMMST Final Demos
III. IMMS Final Demonstration
T1. Final Demonstrations of integrated adaptable IMMST with specifications meeting a military requirement
FY04
FY05
FY06
FY07
FY08